Imaging features of breast tuberculosis

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Abstract

Background: Tuberculosis of the breast is a rare disease, as its incidence remains low even in countries where tuberculosis's incidence is high. It is often overlooked and misdiagnosed as bacterial mastitis. This work aimed to describe the different mammographic and sonographic findings of breast tuberculosis and to outline some imaging features of breast magnetic resonance imaging.

Methods: We conducted a prospective study including 13 patients with breast tuberculosis between 2020 and 2024.

Results: Mammography was abnormal in 10 investigated patients. The main result was an asymmetric density that was diffused in two cases and local in the other cases. Two cases demonstrated multiple mass lesions. Ultrasound was performed in all patients. Six patients presented with a well or poorly defined mass lesion. Four patients presented with ductal dilatation with echogenic components. Two cases have fistulized to the skin surface. Breast magnetic resonance imaging was performed in three patients. One patient had a bilobed mass enhancement on T2 intermediate intensity. The second patient had multiple confluent mass enhancements with irregular margins.

Conclusions: Breast tuberculosis presents with a wide spectrum of imaging features that can closely mimic both inflammatory and malignant breast conditions. Mammography and ultrasound remain key diagnostic tools, while MRI can provide additional information in complex cases. In the emergency setting, ultrasound should be emphasized as the first line modality and raising physician awareness of this pathway is crucial for timely diagnosis and management.

Keywords: Breast Tuberculosis; Mammography; Ultrasonography mammary; Magnetic Resonance Imaging

Introduction

Tuberculosis (TB) of the breast is a rare disease, as its incidence remains low even in countries where tuberculosis's incidence is high (1). It accounts for < 0.1% of all known breast diseases globally (2). It is a rare manifestation due in part to breast tissue being remarkably resistant to tuberculosis, because it provides an infertile environment for the survival and multiplication of *Tuberculosis bacilli* (3). Risk factors include females of reproductive age, multiparity, and Human Immunodeficiency Virus (HIV) co-infection (4,5). TB is often overlooked and misdiagnosed as bacterial mastitis. Therefore, the purpose of this work was to study the different mammographic and sonographic findings of breast TB and to outline some imaging features of breast magnetic resonance imaging (MRI).

Methods

- Patient population

In this prospective study, 13 patients with breast TB were included between 2020 and 2024. Final diagnosis was confirmed by histology proof in 10 cases (obtained on micro biopsy (n=7) or on operative specimen (n=3)), and by proofing treatment in the remaining 3 cases. Exclusion criteria were isolated axillary nodes localization.

- Imaging data acquisition and analysis

Ultrasound was performed in all patients, 10/13 patients underwent mammography, and three patients underwent breast MRI. The MRI protocol consisted of transversal Dynamic Contrast Enhanced (DCE) and axial T1-weighted and T2-weighted sequences. Imaging findings were assessed by both junior and senior radiologists using the 2013 Breast Imaging-Reporting and Data System (BI-RADS) lexicon established by the American College of Radiology.

Results

Demographic data and clinical results

The mean age in our patients was 37±12 years. Of the 13 cases (all female), nine presented a palpable mass/breast nodularity, two patients presented with pain/swelling, and the remaining patients presented with nipple discharge. One patient was pregnant at the time of the first presentation. All patients were Tunisian.

Imaging results

Mammography was abnormal in 10/10 investigated patients. All of them had an asymmetric density that was disseminated in two cases (Fig.1) and local in the other cases. Two patients had multiple mass lesions, two had skin thickening, and only one showed microcalcifications without suspect grouping.

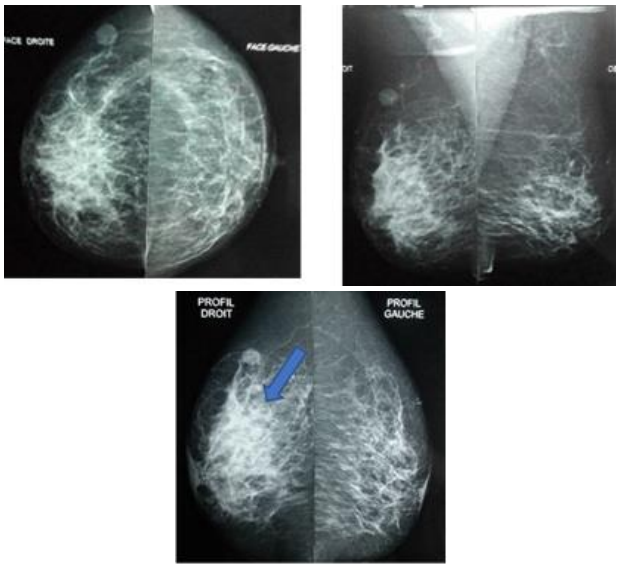

Figure 1: Standard mammogram of face, oblique and craniocaudal view of the right and left breast showing an asymmetric density in the upper quadrants of the right breast (arrow)

Ultrasound was performed in all patients. Six patients had a well or poorly defined mass lesion (Fig.2).

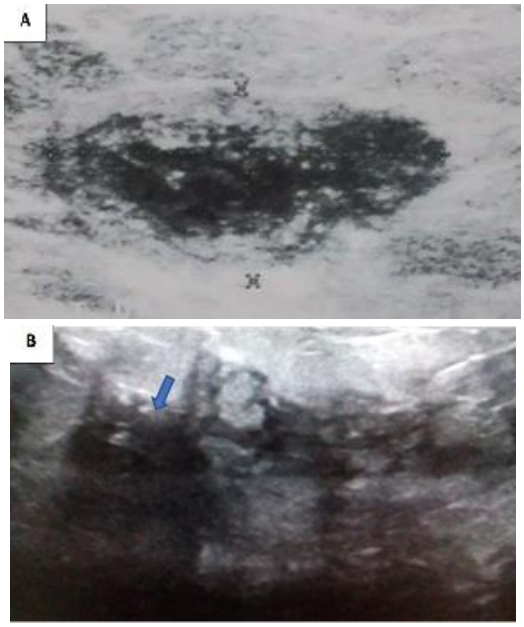

Figure 2: Ultrasound image showing a well (A) or poorly defined (B) mass (arrow)

The disseminated form was seen in two patients having multiple collections, mostly containing debris. Four patients presented with ductal dilatation with echogenic components (Fig.3).

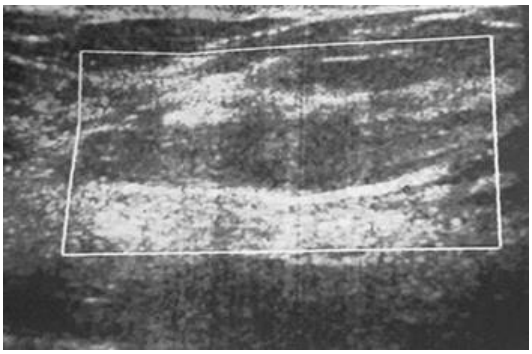

Figure 3 : Ultrasound image of ductal dilatation with an echogenic component

Two cases have fistulized to the skin surface (Fig.4). There were no patients presented with abnormal axillary lymph nodes (with cortical thickness>5mm or replacement of the fatty hilum of the node).

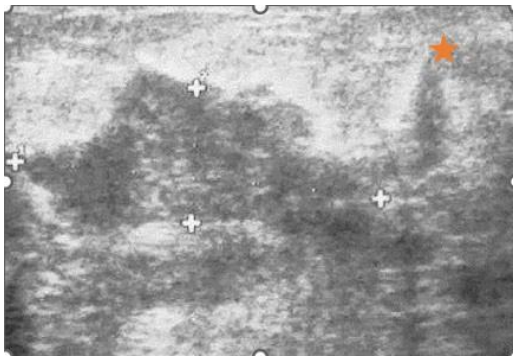

Figure 4: Ultrasound image showing a hypoechoic mass that has fistulized to the skin surface (Star)

MRI was performed on three patients. One patient presented a bilobed mass enhancement (Fig.5) with intermediate intense T2, surrounded by a hypointense, regular and fine halo, hypointense T1, and an early and heterogeneous enhancement (curve type 2).

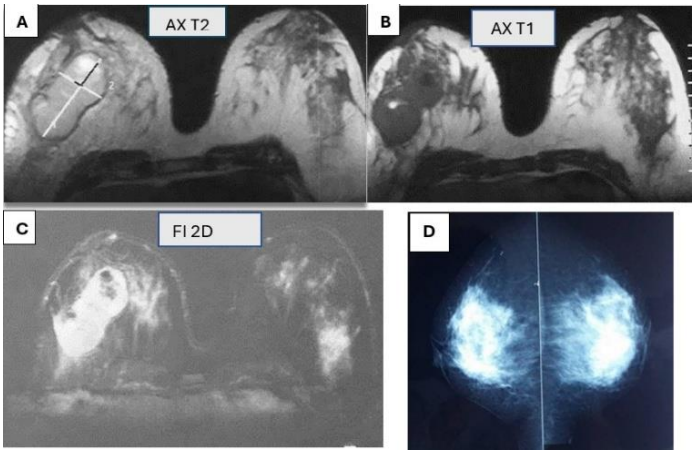

Figure 5: A, B, C: Breast magnetic resonance imaging showing a bilobed mass enhancement of the external quadrants of the right breast. D: Standard mammogram showing asymmetric density of the right breast corresponding to the mass already shown on A B C

The second patient had multiple confluent mass enhancements with irregular margins. One of

these masses presented a rim enhancement pattern, classified at ACR5 (Fig.6,7). The remaining patient was identified as non-mass enhancement (NME).

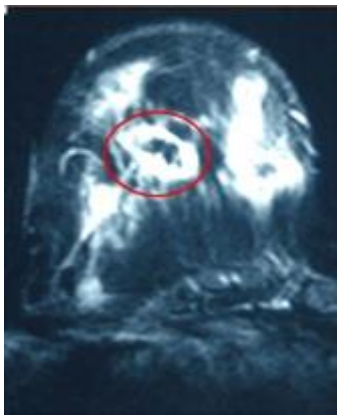

Figure 6: Breast magnetic resonance imaging showing multiple mass enhancements; a mass (encircled) with a rim enhancement

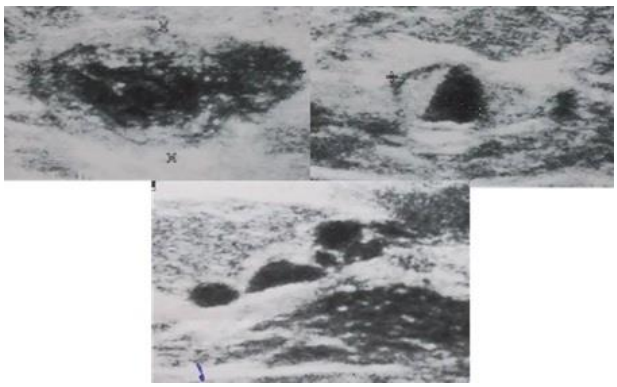

Figure 7: Ultrasound images of multiple and different masses

Discussion

Imaging findings in our series demonstrated a wide spectrum of appearances across mammography, ultrasound, and MRI, underscoring the diagnostic challenge posed by these entities. Mammography was abnormal in all investigated patients, most frequently showing asymmetric densities and, less commonly, microcalcifications. These findings, although non-specific, require further evaluation due to overlap with malignancy features (6).

Ultrasound, the most accessible and widely used modality in inflammatory breast disease, revealed diverse patterns including both well-defined and poorly defined masses, ductal dilatation with echogenic contents, and complex collections, some of which had fistulized. These characteristics are often associated with granulomatous mastitis, abscesses, or periductal mastitis (7). The absence of suspicious axillary lymphadenopathy in all patients supports a benign inflammatory etiology in most cases, although clinical correlation and histopathology remain essential.

MRI, although limited to three patients, added valuable diagnostic information in complex or equivocal cases. The imaging patterns ranged from bilobed enhancing masses to non-mass enhancement (NME), with one case classified ACR5 due to rim enhancement and irregular margins. Such features can mimic malignancy, reinforcing the importance of histopathologic confirmation to avoid overtreatment (8).

In the emergency setting, ultrasound represents the imaging modality of choice, given its rapid availability, non-invasiveness, and ability to distinguish between solid and cystic lesions, evaluate abscess formation, and guide drainage if needed. It is particularly useful for patients presenting with acute painful swelling, suspected abscess, or fistulization, where timely diagnosis and intervention are critical. Mammography has little role in the acute phase due to limited

sensitivity in the presence of pain, edema, and dense parenchyma, and is usually deferred once the acute process subsides. MRI, while highly sensitive for characterizing indeterminate lesions and assessing disease extent, is not routinely indicated in emergencies due to limited accessibility, higher cost, and the need for patient stability. Thus, in urgent clinical scenarios, ultrasound not only provides essential diagnostic information but also facilitates immediate therapeutic procedures such as aspiration or biopsy.

For this reason, raising awareness among emergency physicians about the appropriate imaging pathway is essential. Familiarity with the ultrasound-first approach helps ensure rapid triage and timely drainage or biopsy, prevents misdiagnosis as malignancy, and reduces delays in initiating anti-tuberculous therapy. Such awareness ultimately improves patient outcomes and limits complications related to delayed or inappropriate management.

The commonest presentation of breast TB is a firm, painful or painless unilateral breast lump with or without ulceration suggestive of carcinoma on physical examination (2). Tuberculous mastitis might mimic breast cancer both clinically and radiologically (2). McKeown et al. (9) first described the five main types of infection within the breast: nodular mastitis (the major form in our study), disseminated mastitis, sclerosing mastitis, mastitis obliterans, and acute miliary mastitis (extremely rare). Nodular caseous TB often mimics the appearance of a fibroadenoma or collection on ultrasound, which demonstrates no vascularity. Later in the disease, the lesions begin to develop a fistula to the nipple areolar complex or skin, thus appearing irregular and mimicking carcinomas with ill-defined margins (10).

In disseminated mastitis, multiple small anechoic fluid collections are scattered through the segment of the breast. Background vascularity is usually normal, although hyper-vascularity like bacterial mastitis can also be observed. Fistula and skin thickening, from the zones of abnormality, can develop particularly later in the disease. A single quadrant or multiple quadrants of the breast can be affected (11).

Tuberculous mastitis obliterans is characterized by duct infection, which occludes the ducts, resembling a cystic mastitis. Lesions present as well or poorly defined hypoechoic and anechoic collections, most containing debris, which mimic the appearance of classical bacterial mastitis and may be associated with increased vascularity. The imaging features of sclerosing mastitis mimic inflammatory carcinoma with ill-defined textural change (10).

As the diagnosis of breast TB is difficult, we propose a diagnostic pathway to increase awareness of this pathology, to ensure timely diagnosis, enable prompt diagnosis, and reduce complications' rates:

- TB should be considered in all patients presenting with an abscess or atypical mass.

- Ultrasound followed by core biopsy and tuberculosis culture is advocated to establish the diagnosis.

Conclusion

Breast tuberculosis remains a rare and often misdiagnosed condition, particularly in regions where TB is endemic. Its nonspecific clinical and imaging features frequently mimic more common entities such as bacterial mastitis or malignancy. A high index of suspicion, supported by appropriate imaging—especially ultrasound and MRI—along with histopathological confirmation, is essential for accurate diagnosis and timely management. In the emergency setting, awareness of the imaging pathway—where ultrasound serves as the first-line modality— facilitates rapid triage and intervention, prevents misclassification as malignancy, and reduces unnecessary procedures as well. Raising awareness among emergency physicians is therefore crucial to improving patient outcomes and avoiding diagnostic delays.

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